DIRECT TESTIMONY OF
R. DOW BAILEY
ON BEHALF OF
SOUTH CAROLINA ELECTRIC & GAS COMPANY
DOCKET NO. 2006-5-G

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. R. Dow Bailey, 1426 Main Street, Columbia, South Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am currently Forecast Coordinator in the Resource Planning Department of SCANA Services, Inc.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND BUSINESS EXPERIENCE.

A. I am a graduate of Emory University in Atlanta, Georgia where I majored in history. I also received an MBA from the University of Georgia, with an emphasis on finance and economics. I have also completed all the coursework requirements for a Ph.D. in economics at the University of South Carolina. In addition to these academic studies, I have attended numerous seminars on forecasting and statistics, sponsored by such organizations as NARUC, DOE, the Electric Power Research Institute, and the American Gas Association. Prior to my employment with South Carolina Electric & Gas Company ("SCE&G"), I was employed as an economic analyst with Gulf Oil Corporation; an economist with Wilbur Smith & Associates; a research analyst with the South Carolina Public Service Commission; an economist with CH2M Hill, a consulting engineering firm; and a financial analyst with Northeast Utilities. In June 1983, I began work at SCE&G as an associate analyst in the Forecasting Department, where I have been employed for more than twenty years.

Q. WILL YOU BRIEFLY SUMMARIZE YOUR DUTIES WITH SOUTH CAROLINA ELECTRIC & GAS COMPANY?

A. I am currently responsible for preparing SCE&G's electric and gas forecasts of sales, customers, revenues, and peak demand, as well as other forecasting duties within SCANA.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to discuss the development of SCE&G's gas peak design day.

Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION IN THE PAST?

A. Yes, I have testified before this Commission on several occasions.

Q. PLEASE SUMMARIZE DEVELOPMENT OF THE GAS PEAK DESIGN DAY.

A. Four major steps were involved in development of a peak design day estimate:

1. Baseline information was collected and/or created, including gas use, customers, and weather data.
2. Multiple regression equations were developed which related gas demand to weather and other explanatory variables.
3. Design day weather was chosen and combined with projected customer levels to create a preliminary design day estimate.

4. The peak design day estimate was adjusted down to account for the impact of higher mandated furnace efficiencies. This resulted in the final peak design day value.

Within each major design element a number of other processes and checks were involved, but the above steps represent the primary tasks undertaken.

Q. PLEASE DESCRIBE IN MORE DETAIL THE TASKS INVOLVED IN DEVELOPMENT OF THE GAS PEAK DESIGN DAY.

A. The first step was to create a winter period data set that contained daily firm gas sendout (the volume of gas flowing through a pipeline, also referred to as throughput) and corresponding weather data. This involved adjustment of total daily gas sendout to remove usage by interruptible customers, plus the calculation of Heating Degree Days (HDD) and other weather variables to match the gas dispatching day, which is measured on a 10AM to 10AM basis. Weather is represented by HDD, which can be calculated as the daily average temperature subtracted from 65. For example, if the daily high and low temperatures were 40° and 20°, respectively, then the average temperature would be (40+20)/2=30, and HDD would be calculated as 65-30=35. When HDD are calculated in this manner, colder weather is represented by increasingly higher HDD. If the average temperature is above 65°, by convention HDD are defined as zero.

The pattern of gas consumption for SCE&G shifts upward when HDD are 35 or greater. Without the presence of such weather in the actual data modeled, peak demand estimated could be inaccurate and most likely would understate the true peak demand that occurs on extremely cold days. Therefore, data from the winter of 2002-2003 was used to develop the design day models, because this season contained a period of cold weather during which a new gas peak was established, plus a current customer mix. The firm peak day sendout established on January 23, 2003 represents the highest level experienced by SCE&G to date. The previous firm peak demand had been established on January 25, 1994.

In addition to deriving daily firm sendout for SCE&G, this data was separated into two distinct categories of small and large firm gas users. The former consisted of residential (Rate 32) plus small commercial and industrial customers (Rate 31), while the latter was composed of large commercial and industrial customers (Rates 34 and 35). These two groups exhibit different responses to weather, especially on a weekend vs. weekday basis, so the ability to separately model them was especially meaningful. Small gas users are by far the larger of the two groups in terms of peak demand, with 92% of the peak load, while the remaining 8% is due to large gas users.

Q. PURSUANT TO COMMISSION ORDER NO. 2005-619, IN NOVEMBER 2005 RATES 31 AND 32 WERE RESTRUCTURED. HOW DID THIS AFFECT THE PEAK DEMAND FORECAST PROCESS?

A. Rates 31 and 32 were each disaggregated into two new rates, based on average summer use. Therefore, the distinction between small and large firm gas users remained the same. Categorization of residential customers into distinct class groups was also not affected. So, the rate changes had no impact on the forecast.

Q. HOW WAS THE DAILY INFORMATION USED IN THE PEAK DESIGN DAY ESTIMATION PROCESS?

A. Once the usage and weather databases were created and merged, separate multiple regression models were calculated for the small and large firm customer groups to statistically relate daily sendout with weather and other explanatory variables. The final regression equations are contained in Exhibit No.___(RDB-1) and Exhibit No.___(RDB-2). As these models illustrate, gas consumption patterns are markedly different between the two groups. Small gas users' consumption is not significantly affected by day-types, such as weekends or weekdays, while large gas customers are sensitive to these factors, as well as holidays. Particular emphasis was placed on model accuracy for extremely cold days, because as mentioned earlier these days show significantly higher usage than relatively warmer periods, and it is this type of weather which establishes firm peaks. Exhibits No.___(RDB-3) and (RDB-4) graphically compare the models' predicted values with actual daily results, and also show how gas usage is markedly higher on extremely cold days. The results of the estimation process were very accurate. For the peak day, January 23, 2003, these two models predicted a sendout of 267,959 thousand cubic foot units (MCF), while actual was 277,511 MCF. Thus, the combined models under-predicted sendout by 3.4%. While this difference represents a small variance, we believe that the models would have been even more accurate except for the presence of a light snowfall in the Columbia metropolitan area on the peak day. This snowfall caused a number of businesses and most schools in SCE&G's service area to either slow or cease operations and send employees or schoolchildren home. Upon reaching home, families increased the temperature settings on furnace thermostats to warm their houses. These settings are generally reduced as individuals leave home for work or school. Therefore, small user gas demand was higher than it otherwise would have been on a typical weekday.

Q. WHAT IS THE ROLE OF THESE EQUATIONS IN THE PEAK DESIGN DAY ESTIMATION PROCESS?

A. It is possible to estimate peak day sendout using projections for firm customers in aggregate and the models described above. However, this could result in over-statement of the peak, since the fastest growing customer groups are small users who place less demand individually on the system than large customers. To avoid this problem, individual multiple regression models were created for each firm rate group (Single-family, multi-family, and mobile home residential Rate 32 customers; small commercial and industrial Rate 31 customers; large commercial and industrial Rate 34 customers; and commercial and industrial firm transport Rate 35 customers) which related average daily use to daily weather and seasonal variables. Average daily use in this case was interpolated from monthly billing data. As a test of these models' accuracy, actual January customers and peak day weather were used to determine how closely they modeled the actual peak day of January 23, 2003. The simulated results were also within 3.4% of actual, which indicated their validity as instruments to be used in the design day estimation process. Specifically, the average daily use models were used to allocate the daily sendout model coefficients to a class/rate and per customer basis. These allocated sendout equations were then combined with the detailed class/rate customer forecasts to derive the peak design day estimate.

Another way to understand the necessity of the above process is recognizing that the peak demand equations developed for winter 2002-2003 need to be adjusted for changes in customer mix over time. Therefore, a method was developed to allow the peak demand equations to change as customers vary.

Q. ARE THERE ANY OTHER ADJUSTMENT FACTORS THAT NEED TO BE MADE IN THE PEAK DESIGN DAY ESTIMATION PROCESS?

A. Yes. While the above methodology might be quite accurate in the short-term, eventually it would overstate peak demand. This is true because all furnaces shipped by manufacturers since 1992 are required to be at least 78% efficient in accordance with federal law. Prior to that date furnace efficiencies were around 64%, and based on American Gas Association (AGA) data current weighted average efficiency shipments of furnaces in the United States in 1997 averaged approximately 85%. Some furnaces now available in the market have efficiencies greater than 90%. This change in average efficiency is explicitly captured in our projected design day estimates.

The regression models described earlier in this testimony capture the embedded efficiencies of current gas customers. As the forecast horizon expands, however, new gas customers on average will use less gas on any given heating day than average gas customers presently do, because the current mix of customers includes less efficient furnaces installed prior to the implementation of the higher efficiency standards. Therefore, projecting peak demands with the average use values determined from winter 2002-2003 would overstate firm peak day sendout, with the error growing over time. To incorporate this factor into the design day value, estimates of savings due to more efficient furnaces were first developed. Customers were then disaggregated into existing, replacement, and new customer categories. New customers were simply the difference between the base year, 2002, and any given future year. Replacement customers were estimated by assuming a furnace replacement rate of 5% annually of the base year customer base. Over time, then, the existing customer group declined, while the new and replacement customer groups increased. Existing customer peaks were projected using the equations without adjustments for furnace efficiencies, while replacement and new customer projections were reduced by those savings.

Q. WHAT VARIABLES BESIDES AVERAGE USE DETERMINE THE PEAK DESIGN DAY MODEL RESULTS IN FUTURE YEARS?

A. The gas peak demand models' output values were also determined by forecasts of customers and weather.

Q. HOW WERE THE CUSTOMER PROJECTIONS USED IN THE DESIGN DAY FORECAST DEVELOPED?

A. Customer projections were created on a monthly class/rate basis as part of the sales and revenue forecast process. A statistical method known as Box-Jenkins, or ARIMA modeling, was used to estimate short-range values. Since customer growth is generally very stable, these projections are quite accurate. For example, the average annual residential customer mean absolute percent error (MAPE) for the past three years ending 2005 was 0.7%. As discussed earlier, Rates 31 and 32, which comprise the small users group, were restructured in November 2005. Rate 31 was disaggregated into Rates 31 and 33, while Rate 32 was replaced with Rates 32S and 32V. Therefore, customer forecasts appropriate for the models developed under the prior rate structures were re-created by summing the disaggregated rates into their previous groupings.

Q. HOW WAS THE HDD FORECAST FOR THE PEAK DESIGN DAY CHOSEN?

A. The calculation of HDD has been previously discussed. The HDD value chosen for the peak design day was the coldest day experienced on the SCE&G system since 1980, which was 47.75. As mentioned earlier the gas dispatch day runs from 10AM to 10AM instead of a calendar-based midnight to midnight basis. Therefore, hourly temperatures were organized on a gas dispatch day to more properly associate weather variables with daily sendout values. The regression models also included prior day HDD as an explanatory variable for the large customer group, so the peak design day value for this input was thus the actual value from the day preceding the peak day, which was 42.00 HDD. For the small customer group, the primary weather driver was a combination of the current day's maximum temperature, plus the average of the current and previous day's minimum temperatures. The value used for this variable was 15.63. Combining the disaggregated models, customer projections, furnace efficiency improvements, and design day weather conditions, peak demand for the winter season of 2006-2007 is projected to be 350,043 MCF. Since this estimate was based on burner-tip values, it was adjusted upwards by 2% to account for system losses. This peak demand estimate was also converted to dekatherms ("Dt") assuming a conversion factor of 1.025. Therefore, the final value used to develop SCE&G's allocation factors was 366,116 Dt.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Exhibit No.__(RDB-1)

SCEG Gas Peak Models Winter 2002-2003

The REG Procedure
Model: MODEL1
Dependent Variable: r3132

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1.441287E11	48042900751	1003.73	<.0001
Error	86	4116337069	47864385		
Corrected Total	89	1.48245E11			

Root MSE	6918.40910	R-Square	0.9722
Dependent Mean	127799	Adj R-Sq	0.9713
Coeff Var	5.41349		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	369934	5166.17272	71.61	<.0001
newavg	1	-5194.06180	108.27558	-47.97	<.0001
hddadder	1	705.88892	137.01858	5.15	<.0001
d0131	1	37467	6969.30753	5.38	<.0001

SCEG Gas Peak Models Winter 2002-2003

The REG Procedure
Model: MODEL1
Dependent Variable: r3132

Durbin-Watson D	2.047
Number of Observations	90
1st Order Autocorrelation	-0.036

Exhibit No.__(RDB-2)

SCEG Gas Peak Models Winter 2002-2003

The REG Procedure
Model: MODEL1
Dependent Variable: firmind

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	229013203	38168867	161.73	<.0001
Error	83	19588073	236001		
Corrected Total	89	248601276			

Root MSE	485.79921	R-Square	0.9212
Dependent Mean	9220.87778	Adj R-Sq	0.9155
Coeff Var	5.26847		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	7185.10325	151.26571	47.50	<.0001
hdd	1	112.92357	7.59015	14.88	<.0001
lhdd	1	53.61361	7.39848	7.25	<.0001
weekend	1	-2374.39959	121.17945	-19.59	<.0001
xmas	1	-2927.18831	227.03577	-12.89	<.0001
newyear	1	-2586.58886	358.17228	-7.22	<.0001
fri	1	-767.15547	152.29673	-5.04	<.0001

SCEG Gas Peak Models Winter 2002-2003

The REG Procedure
Model: MODEL1
Dependent Variable: firmind

Durbin-Watson D	2.096
Number of Observations	90
1st Order Autocorrelation	-0.068

Exhibit No.__(RDB-3)

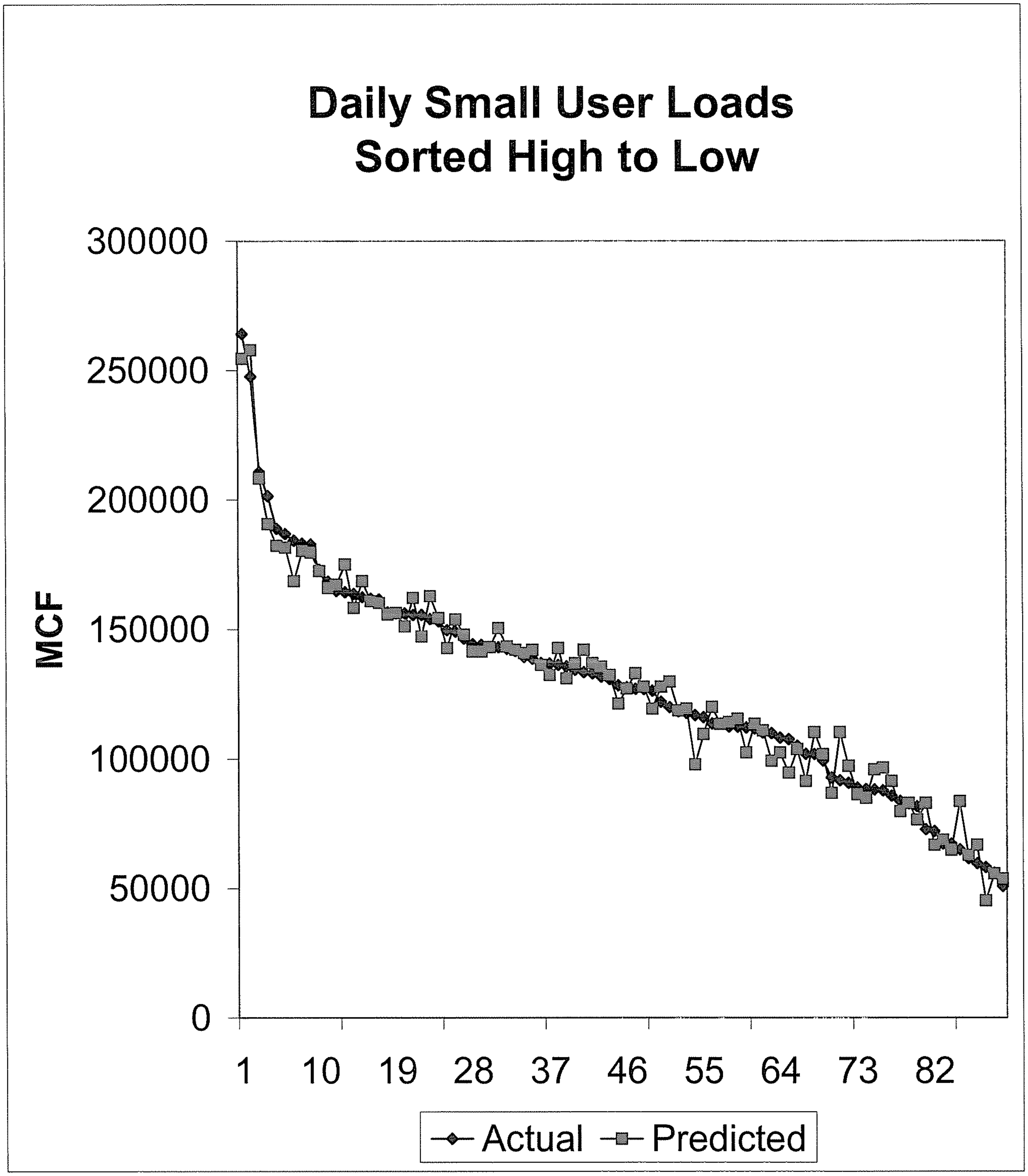

Exhibit No.__(RDB-4)